REMARKS

Present Status of the Application

Claims 1-10 remain pending of which claims 1-5 have been amended and claims 6-10 has been added to more explicitly and more clearly describe the claimed invention. Further, Applicants have amended the specification. More specifically, Applicants have changed the term "reflectivity" to "transparency" for expressing the quality of the protective layers in the above paragraphs. Applicants respectfully submit that since the invention is directed at forming protective layers for protecting various pixel cell areas (102, 106) of a micro LCD device, and that the protective layers should not adversely affect the display properties of the pixel areas. Accordingly, it is understood by those skilled in the art that the protective layers should have a high degree of transparency so that the light can easily pass through it to reach the pixel areas and vice versa without adversely affecting the display quality of the pixel cells. And further, the transparency property of the protective layers inherently flow through the materials of the protective layers as claimed in claims of the present invention. Accordingly, Applicants respectfully submit that the above amendments to specification and claims do not add new matter. For at least the following reasons, Applicants respectfully submit that claims 1-10 are in proper condition for allowance. Reconsideration is respectfully requested.

Atty Docket No.: TKHR4580 Serial No.: 09/479,483

Response to Rejections under 35 U. S. C. 112

The Office Action rejected claims 1-5 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicants regard as the invention.

In rejecting the above claims the Office Action indicated that in claims 1, it is questioned what is recited through use of "prevents scratching. It appears that the literal meaning is not intended and instead some degree of scratch resistance is intended. The term "high reflectivity" in claim 1, line 7, is a relative term which renders the claim indefinite. The term "high" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. If applicants intend a particular reflectivity it must be clearly recited.

In response thereto, Applicants have amended claim 1. After entry of the above amendments to claim 1, it is believed that the above objections can be overcome. Reconsideration is respectfully requested.

Further, the Office Action indicated that in claim 2, it appears that "an" before the oxide material..." should be deleted. The term "thin" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not reasonably apprised of the scope of the invention. If applicants intend a particular thickness it must be clearly recited.

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In response thereto, Applicants have amended claim 2. After entry of the above amendments to claim 2, it is believed that the above objections can be overcome. Reconsideration is respectfully requested.

CONCLUSION

For at least the foregoing reasons, it is believed that all pending claims 1-10 are in proper condition for allowance. If the Examiner believes that a conference would be of value in expediting the prosecution of this application, he is cordially invited to telephone the undersigned counsel to arrange for such a conference.

Respectfully submitted,
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Date: 9/30/2002

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Version with markings to show changes made

In The Specification:

In the paragraph beginning at line 16 on page 6.

Thereafter, a second protective layer etching process is conducted to define the positions of protective layer in the peripheral circuit area 104 and the pad spacers. Referring to Figure 1E, the positions for the protective layer 122 of the peripheral circuit area 104 and the pad spacers 118b and 120 are formed simply by defining the silicon nitride layer 116 and the oxide layer 114 using the photolithography technique. The pixel cell area 102 mandates a protective layer with a greater [reflectivity]transparency. The combination of the silicon nitride layer 116 and the oxide layer 114, however, does not have a high [reflectivity]transparency. The exposed silicon nitride layer 116 and the oxide layer 114 are thus removed in the etching process using the pixel cells 106 as an etch stop. A majority of the pixel cells 106 are then exposed. The pad spacer 120 of the pixel cell area 102 is also defined in this etching process based on the previously defined oxide layer 118a. On the other hand, the peripheral circuit area 104 must be covered with a protective layer to prevent scratching and moisture penetration. The silicon nitride layer 116b and the oxide layer 114b in the peripheral circuit area 104 are retained as the protective layer 122 for the peripheral circuit area 104, which is completed concurrently in the second protective layer etching process. Furthermore, the peripheral circuit area 104 also needs the formation of a pad spacer. As a result, the peripheral circuit area 104 retains a portion of the oxide layer 118b as a pad spacer during the definition of the oxide layer 118.

In the paragraph beginning at line 11 on page 7.

The pad spacer 120 of the pixel cell area 102 is formed by the oxide layer 118a, the silicon nitride layer 116a and the oxide layer 114a. The pad spacer 122 of the peripheral circuit area 104 is formed by the oxide layer 118b and the underlying protective layer 122. The area of the oxide layer 118a defined in the pixel cell area 102 cannot be too big, for example,

approximately 4 microns x 4 microns, because a pad spacer 120 with an overly big area affects the [reflectivity]transparency and the light blocking effect. Furthermore, the pad spacer 120 of the pixel cell area 102 needs to form above the insulation material 112, which is the intersection of the pixel cells 106. As a result, the arrangement and the dimension of the pixel cells 106 in the pixel cell area 102 determine the dimensions of the pad spacer 120.

In the paragraph beginning at line 7 on page 8.

A protective layer 124 with a higher [reflectivity]transparency is further formed on the substrate 100 as shown in Figure 1F. The [reflectivity]transparency of the protective layer 124 is high enough for light to transmit through the protective layer 124 to reach the cell pixels 106 and to reflect back. The protective layer 124, for example, is a thin oxide layer or a combination of the silicon nitride layer/oxide layer. The protective layer 124 covers at least the pixel cells 106 in the pixel cell area 102 and serves as a protective layer for the pixel cells 106. The protective layer 124 can also cover other areas in the substrate 100. The thin oxide layer is, for example, a chemical vapor deposited tetra-ethyl-ortho-silicate (TEOS) layer of approximately 500Å thick.

In the paragraph beginning at line 16 on page 8.

Since the [reflectivity]transparency for the thin oxide layer 124 is approximately 85%, covering the pixel cells 106 with the thin oxide layer 124 does not seriously affect the [reflectivity]transparency of the pixel cells 106 when the light reaches the pixel cells 106. The thin oxide layer 124 can also provide an appropriate protection for the pixel cells 106.

In the paragraph beginning at line 20 on page 8.

The present invention provides a multiple etching steps in forming the multi-layer of the thin films in order to accommodate the different demands of the protective layers in the reflective

micro-LCD. For example, the fabrication of a silicon nitride/oxide material is to protect the peripheral circuit area from moisture penetration and from being scratched. For the pixel cell area, which mandates a high [reflectivity]transparency, an oxide material is formed as the protective layer. Furthermore, to facilitate the filling of the liquid crystal, the height of the pad spacers formed are higher. The pad spacers are formed with a structure of oxide material/nitride material/oxide material, wherein the order of the thin films and their thicknesses can vary accordingly.

In The Claims:

Claims 1-5 have been amended as follows:

1. (Amended) A fabrication method for a multi-layered thin film protective layer, which is applicable to a substrate comprising a first device area and a second device area, the method comprising the steps of:

forming a first protective layer on the first device area, wherein the first protective layer prevents the first device area from moisture [penetration]and scratch[ing];

forming a plurality of material structures on the first protective layer, the material structures and the underlying first protective layer serving as first pad spacers;

[forming a second protective layer on the second device area, wherein the second protective layer has a high reflectivity for light transmission; and]

forming a plurality of oxide material/silicon nitride/oxide material structures on the second device area serving as second pad spacers in [the first device area and]the second device area, wherein the second pad spacers are higher than the first protective layer; and

forming a second protective layer for at least covering the second device area, wherein a transparency of the second protective layer is higher than a transparency of the first protective layer.

2. (Amended) The fabrication method for a multi-layered thin film protective layer according to claim 1, further including:

forming sequentially a first oxide layer, a silicon nitride layer and a second oxide layer on the substrate;

[defining]patterning the second oxide material to form material structures and upper oxide material of the material of the material/silicon nitride/oxide material structures;

[defining]patterning the silicon nitride layer and the first oxide layer to form a silicon nitride/oxide material structure as the first protective layer in the first device area and to form [an oxide material/silicon nitride/oxide material structures in the first device area and the second device area]a bottom oxide material and a silicon nitride of the material/silicon nitride/oxide material structures; and

forming a [thin]third oxide layer on the substrate as a second protective layer.

3. (Amended) The fabrication method for a multi-layered thin film protective layer according to claim 2, wherein the [reflectivity]transparency of the second protective layer is approximately 85%.

4. (Amended) The fabrication method for a multi-layered thin film protective layer according to claim 2, wherein the [thin]third oxide layer is approximately 500Å thick.

5. (Amended) The fabrication method for a multi-layered thin film protective layer according to claim 2, wherein the [thin]third oxide layer includes tetra-ethyl-ortho-silicate.

Claims 6-10 are newly added.